POECILICHTHYS OSBURNI, A NEW DARTER FROM THE UPPER KANAWHA RIVER SYSTEM IN VIRGINIA AND WEST VIRGINIA.

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The handsome percid named and described in this paper is the fifth species of fish to be indicated as characteristic of the upper Kanawha system. The others, all cyprinids, are *Notropis scabriceps* (Cope), *N. kanawha* Jordan and Jenkins, *Phenacobius teretulus* Cope and the recently described *Parexoglossum lauræ* Hubbs (1931). All of these species occur, so far as known, solely in the Kanawha River basin above the Kanawha Falls, the position of which is indicated by the arrow in Fig. 1. This upper Kanawha River system, the outlines of which are indicated by the black line in Fig. 1, is in other ways set apart, from the standpoint of fish distribution, as one of the most distinctive subdivisions of the vast Mississippi system.

The Upper Kanawha system is a cut-off portion of the Ohio River system, which is the chief home of *Poecilichthys variatus* (Kirtland), the only species with which *P. osburni* is closely related. The range of *P. variatus* is also indicated, by record stations and by assumed limits, in Fig. 1. The basis for mapping the distribution of *P. variatus* may now be indicated by states:

DATA ON THE DISTRIBUTION OF *POECILICHTHYS VARIATUS*.

All records refer to the Ohio River system, except for the single record stations each in Arkansas and Missouri.

NEW YORK.—Recently collected by Dr. John R. Greeley in French Creek, in Chautauqua County, near the western boundary of the state.

PENNSYLVANIA.—Recorded by Bollman (1886: 339); McConnell (1905: 178); Fowler (1919: 70), and Fowler and Carlson (1927: 72). We have no reason to doubt the validity of any of these reports, although only the specimens recorded by Jordan have been seen. One new record for the state, for French Creek, near the New York state line, is indicated on the map. Specimens were recently taken there by Dr. Greeley.

OHIO.—This species was originally recorded from the Mahoning River by Kirtland (1838: 168 and 192), who added, "I am indebted to Mr. Charles Pease for a specimen of the same species taken in the Cuyahoga," which is a small river entering Lake Erie at Cleveland. Unfortunately this record is probably incapable of verification because the stream is now badly polluted. The doubt as to the validity of this record is increased to an almost certain indication of error when we recall that Kirtland mentioned only the Mahoning

River in describing the species (1840: 274, Pl. 2, Fig. 2); that he did not recognize the species now known as *P. coeruleus* until 1854 (p. 4); that he in 1850 (p. 1) recorded *variatus* not only from the Mahoning and Scioto rivers, but also from Chicago, Illinois, and that he, according to Jordan (1885: 163) later regarded Storer's *Etheostoma coerulea* as identical with his own *variatus*. These circumstances warrant us in questionably referring Kirtland's two records of *variatus* from the Great Lakes drainage to *Poecilichthys coeruleus*, which is there the most abundant of bright-colored darters. A few other Ohio records of *P. variatus* are given by Henshall (1888: 80), Osburn and Williamson (1898: 20) and Osburn (1901: 97), but the majority of the records indicated in Fig. 1 were made recently by the Lake and Stream Survey of the

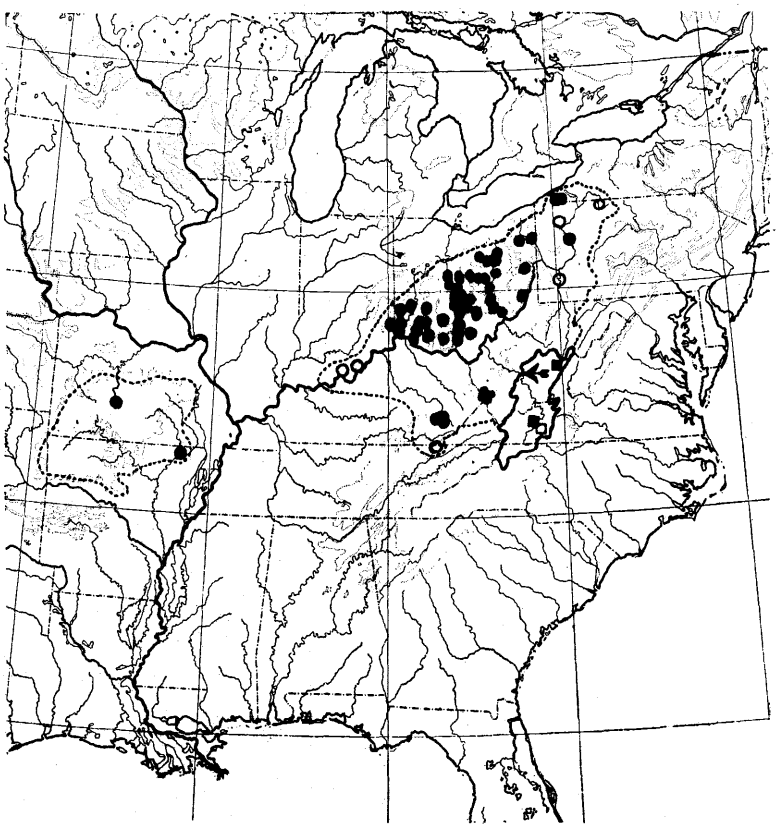

FIG. 1. The distribution of *Poecilichthys osburni* and *P. variatus*.

The supposed range of *P. osburni*, surrounded by a solid line, is the drainage basin of the upper Kanawha system, above the Kanawha Falls, which are located by the arrow.

The range of *P. variatus* as now provisionally determined is surrounded by broken lines.

The solid squares locate the two record stations of typical *P. osburni*.

The hollow square locates the locality where the variant type of *P. osburni* was found.

The solid circles indicate the confirmed record stations for *P. variatus*.

The hollow circles represent the unconfirmed record stations for *P. variatus*.

Ohio Division of Conservation. Other reports of *variatus* for Ohio, as Jordan's (1882: 973), refer either to *Poecilichthys coeruleus* or to *Hadropterus maculatus* (see Jordan, 1885: 163).

INDIANA.—Reported by Jordan (1885: 163; Evermann (1886: 8); Evermann and Bollman (1886: 339); Woolman (1892: 280); Hay (1894: 278), and Cockerell (1913: 156). Some doubt pertains to the last record, which may have been based on specimens holding over on erroneous identification.

WEST VIRGINIA.—Neither Goldsborough and Clark (1908) nor other authors have recorded *Poecilichthys variatus* from West Virginia. The junior author, however, has seen specimens recently taken by John Addair in the Guyandot River at Justice City, Mingo County; in the Tug Fork at Gates in the same county, and at Mohawk in McDowell County, and in Pigeon Creek, an eastern branch of the Tug, at Delborton, Mingo County. We are obliged to Mr. Addair for permission to announce his discovery of this darter in West Virginia. In West Virginia, *P. variatus* is apparently generally distributed except in the territory of *P. osburni*—the Kanawha basin above the falls.

KENTUCKY.—Recorded by Woolman (1892: 280), and Evermann (1918: 358). Some of Woolman's specimens have been re-examined. Evermann's record for the South Fork of the Cumberland was of course based on *P. coeruleus*, which in 1878 passed under the name of *variatus*.

TENNESSEE.—Evermann and Hildebrand's (1916: 450) record, the only one for the state and for the distinctive and rather well-worked fauna of the Upper Cumberland system, though indicated as a hollow circle on our map, is not accepted without reservation. The record was accompanied by no description and was based on only one specimen, which we have not been able to relocate.

ARKANSAS.—The only published records of *P. variatus* for any locality outside of the Ohio basin are (1) the doubted one for Easton, in the Delaware system of Pennsylvania (Jordan and Evermann, 1896: 1070), which record is indicated as surely erroneous by the finding of other western species in the Museum of Comparative Zoology similarly mislabelled "Easton, Pa." and (2) the record for the Arkansas River drainage of Arkansas by Hubbs and Ortenburger (1929: 48).

MISSOURI.—This Arkansas record station is rendered less isolated by the recent finding of this species in the Missouri River system of Missouri, by J. Clark Salyer. The specimens, corresponding well with topotypical ones of *variatus*, were collected in the Niangua River drainage near Marshfield, Missouri.

The intimate relationship of *P. osburni* with *P. variatus* is conclusively testified to by the agreement in many highly distinctive features of structure, form, color and habitat. They agree in having the anal fin unusually large and long, almost as large as the second dorsal fin, and the pelvic fins rather widely separated, for a species of the large group now usually thrown together as the genus *Poecilichthys*, in these respects approaching or resembling the forms of *Ulocentra*, *Hadropterus* and related genera. The two species further resemble one another in being, for their group, rather large and robust, heavy-finned fishes. In the male colors they agree in many features, notably in having bright orange vertical bars, an orange-carmine horizontal band on the lower sides anteriorly and scattered carmine spots on the pectoral fin. In both sexes, but most conspicuously in the young, the body in both species is marked by regular, oblique blackish saddles, much like those of the hog sucker *Hypentelium*. Agreement between the two species is close also in squamation, number of fin rays, etc. In correlation with their characters, both species inhabit extremely swift water, living among stones and boulders in rapids. The close relationship of *P. osburni* with *P. variatus* can scarcely be questioned.

The differences between *osburni* and *variatus* are nevertheless striking. *P. osburni* is the more terete; less arched and less elevated at the shoulders, and usually more slender (in adults the depth is contained in the standard length, 4.85 (rarely 4.55) to 5.3 times, instead of 4.3 to 5.0 (rarely 5.2) times). In *osburni* the snout is sharper and longer than in *variatus*, less bluntly decurved, and the eye is smaller; as a consequence, the eye is contained 1.2 to 1.5 times in the snout, instead of 0.9 to 1.0 times. The eye is contained in the head 4.0 to 5.2 in contrast with 3.4 to 4.05 times. The head averages smaller than in *variatus* (contained 3.7 to 4.2 as opposed to 3.4 to 4.0 times in standard length). The gill-membranes in *osburni* are less broadly united across the isthmus than are those of *variatus*, forming a sharper indentation posteriorly. The posterior part of the breast is usually scaleless in *osburni*, usually scaled in *variatus*. Numerical differences in number of scales, fin-rays and color markings are:

	P. osburni	*P. variatus*
Scales above lateral line	8 to 10, usually 9	7 or 8, usually 7
Scales along lateral line	58 to 68	50 to 58
Scales below lateral line	12 to 14, usually 13	11 to 13, usually 12
Dorsal rays	XI to XIII, 13 to 15	XI to XIII, 12 to 14, usually 13[1]
Anal soft rays	9 to 11, usually 10	9 or 10[1], usually 9
Black saddles on back	5	4
Orange bars in male	11 or 12	5 or 6

The boldest of the differences in the colors of the males involves the orange bars. The yellow area, carmine-centered, which extends from the pectoral to the anus, is encroached upon from above by the anteriormost of the orange bars in *osburni*, whereas in *variatus* this area, as also the space above it, is free from these bars, which in that species are restricted to the posterior part of the body. The dark saddles are less solid and less blackish, and more tesselated, in *osburni* than in *variatus*. The yellow blotch on the cheek of the male is much more conspicuous than in *variatus*, in which it is represented merely by a lightening of the ground color, and centers in a bright red spot which is not evident in that species.

P. osburni apparently attains a larger size than *P. variatus* by about a centimeter. Our largest specimen is 86 mm. long to caudal fin.

We now proceed with the description of the new species.

Poecilichthys osburni, new species.
Kanawha darter.

Holotype: Cat. No. 92409, Museum of Zoology, University of Michigan, is a male 75 mm. long to caudal base, collected in Stony

[1]One aberrant specimen from Ohio showed 16 soft dorsal rays and 11 soft anal rays; unconfirmed counts given in the literature give the dorsal spines as high as 14 and the anal soft rays as low as 7.

Creek, a tributary of the Greenbrier River, Pocahontas County, West Virginia, by John Addair, on June 2, 1931.

Paratypes: Seven male and female adults 60 to 86 mm. long, collected with the holotype; 2 males collected about a year previously at the same place; a female (39542, U. S. National Museum), collected many years ago by McDonald in Reed Creek, Virginia, and 7 male and female adults collected in the same stream, which is a western tributary of the New River, by Carl L. Hubbs and Edwin P. Creaser, on May 17, 1931, at a point two or three miles below Max Meadows, Virginia, at an elevation of 1,950 feet. The paratypes are deposited in the Ohio State Museum, National Museum and the Museum of Zoology, University of Michigan.

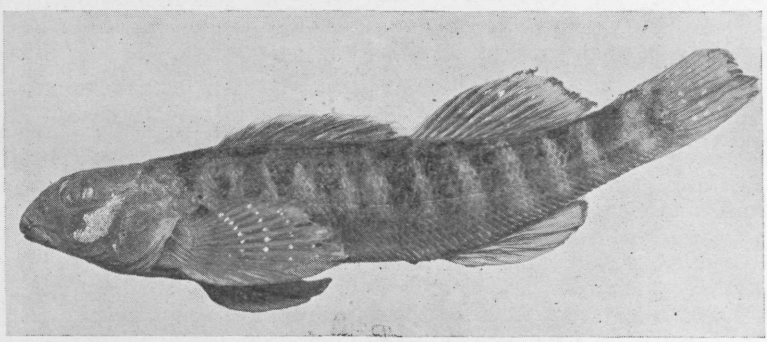

FIG. 2. *Poecilichthys osburni.* (A retouched photograph of the holotype.)

The courtesy of Mr. John Addair in allowing us to describe this darter is gratefully acknowledged.

The body is rather terete, as its greatest width is contained 1.4 times in the greatest depth. The anterior dorsal profile rises rather abruptly, though not so abruptly as in *P. variatus*, from the tip of the snout to above the eye, continuing to rise very gently to the middle of spinous dorsal, then curving gently downward to the rather deep caudal peduncle. The ventral contour approximates but is less curved than that of the dorsal. The mouth is rather small, low, subhorizontal, with included lower jaw. The teeth are small and subequal, and in rather broad bands on the jaws; there are teeth on the vomer. The premaxillary is non-protractile. The cheeks are rather conspicuously tumid. The preopercle is entire; the opercular spine is sharp. The gill-membranes meet at a somewhat acute angle, although they are still broadly joined.

The head is entirely devoid of scales (in *variatus* there are occasionally a few scales on the upper part of the opercle). The breast is also scaleless (rarely partially scaled near the ventral fins; this region is usually scaly in *variatus*). The lateral line is complete (occasionally a pore is missing).

The fins are all large. The two dorsals are joined (slightly separated in some paratypes). The highest dorsal spine is contained 1.35 times

in the highest soft ray. The pectoral fins are slightly longer than the head, and comprise 15 (rarely 14 or 16) rays, as in *variatus*. The caudal fin is subtruncate, slightly emarginate, with broadly rounded lobes.

This species is surely one of the most beautifully colored of the darters. The prevailing colors of the type and other adult males (described from fresh specimens in formaldehyde) are various shades of dark green and orange. The darkest color, a blue-black, appears on the occiput and on a vertical bar from the eye downward. The opercles are also very dark. The cheeks are largely occupied by a rhomb of bright yellow, grading into red medially. In front of the subocular bar is a similar though less conspicuous mark, obscured in high males. The middle of the snout is flushed with red. There are strong flushes of yellow on the lower surface of the head. The branchiostegal membranes are light yellow, and there is a bar of orange on either side of the midline, near the base of the lowest branchiostegals. The membrane between the mandibles is light yellow, while the rami themselves are metallic blue.

Twelve deep greenish-blue bars cross the trunk along the side of the body, not counting the large blotch at the caudal base, which together with a dark shade across the base of the caudal forms a more or less definitely triangular mark. The dark bars almost completely encircle the body behind the anus, and are rather narrowly conjoined dorsally. The twelve intervening light areas (not counting the dash of light behind the occiput), narrower and shorter than the blue bars, are deep orange. The lower third of the side of the fish, from just behind the pectoral base to near the anus, carries a brilliant horizontal blotch, grading from yellow at the edge to a brilliant orange-carmine medially; a most striking color feature, shared only with *P. variatus*. Medially the belly is pale. The breast is blackish blue between a pair of bright yellow spots which lie just below the pectoral fins.

The spinous dorsal is largely covered by a crescent of deep greenish-blue, paler on the spines than on the membranes; the basal crescent is lavender-gray, with a wedge of purplish brown on each membrane; the margin is a yellow band becoming an intense orange medially. The soft dorsal is dusky blue on the webbing, grading outward into gray within the sooty border; the gray portions of the membranes contain streaks of fire-orange; the rays themselves on their basal halves are scatteringly spotted with bright orange-red spots. The caudal is similar to the second dorsal, but the basal color is much lighter and the red spots are much more intense. The anal fin is green-blue on membranes of basal two-thirds; the rays outward are orange yellow, producing an interrupted band; the margin of the fin is milk-white anteriorly, but becomes sooty on membranes posteriorly. The pelvic is blackish green-blue, with the edges of the rays gray, and the spine and the outer border milk-white, and with some orange near border laterally. The pectoral fin is the lightest of all and the most brilliantly spotted with fire-orange; these spots are in three or four curved grayish streaks, which separate the green-blue ground color of the rays into rather definite curved bands; the outer part of the fin is yellowish on the rays.

Less developed males are not so brilliant, and the color pattern is less distinct and approaches that of the females. In that sex and in the young males the broad greenish and orange bars of the sides are much disrupted and more or less obsolescent anteriorly, and extend but little above the lateral line, where they tend to be truncated by a light greenish streak. The shoulder region and the head are colored much as in the males, but the orange bars on the branchiostegals are smaller and browner, and the orange on the cheek is diffused over the diamond-shaped whitish area. The spinous dorsal is not quite so bright as in the males, but the main band is a clearer green. The soft dorsal is also similar to that of the males, but lighter, and with rows of greenish black spots near the base. The pectoral and caudal fins are banded with dusky green and clear transparent orange. The pelvic and anal fins are cream-yellow, with whiter borders.

An outstanding feature of the species is the development of black saddles, similar to those of *P. variatus*, but less solid, more tesselated by blackened scale borders, and more numerous; there are five instead of four, the extra one being accounted for by the presence of two instead of only one on the caudal peduncle. An imperfect saddle also appears below the middle of the spinous dorsal, in a region where scarcely any darkening is evident in *variatus*. The most conspicuous saddles, as in *variatus*, are those just before the spinous dorsal, in the region between the dorsals, and below the posterior part of soft dorsal. The first saddle, fused with the first dark bar, is continued to the axil of the pectoral fin.

The young closely approach *Boleosoma* in color pattern.

Measurements and counts of holotype: Head, 3.85; depth, 5.0; eye in head, 4.6; eye in snout, 1.5; bony interorbital, 2.7 in eye; least suborbital width, 6.2 in head; upper jaw, 3.6; highest dorsal spine, 1.4 in highest dorsal soft-ray, 2.2 in head, 2.5 in first dorsal base; highest dorsal soft-ray, 1.4 in head, 1.1 in base of second dorsal; length of caudal fin, 1.5 in head; highest anal ray 1.2 in base of fin, which is contained 1.2 times in base of dorsal and 1.7 times in head; length of longest pectoral ray, 0.95 in head, of pelvic fin, 1.7. Dorsal rays, XIII–13; anal, II, 9; pectoral, 15. Scales, 8–64–13.

Variants.—Two specimens, 30 and 45 mm. long, from Big Reed Island Creek, at an elevation of 2,500 feet, just below an old mill dam in Carroll County, Virginia, collected by Hubbs and Creaser in 1931, resemble the smaller paratypes, but differ notably in having the dark markings more tesselated and disrupted, and the scales much larger, as large as in *P. variatus*. Otherwise they are very similar, and probably represent merely a local race. It is of interest that they were taken in a creek which flows into the New River almost opposite Reed Creek, where typical *osburni* was taken.

Some measurements* and counts of the two aberrant specimens follow: Head, 3.5 and 3.9; depth, 6.0 and 5.1; eye in head, 3.7 and 4.0; eye in snout, 1.0 and 1.25; dorsal rays, XI–12 and XII–13; anal rays, II, 8 and II, 9; pectoral rays, 15 in each; scales, 7–54 and 57–11.

*In comparing these measurements with those previously given, allowance must be made for the fact that these specimens are immature.

We are happy to associate with this species the name of Dr. Raymond C. Osburn of Ohio State University—long fond of the exquisite little percid fishes known as darters—in recognition of the contributions he has made, by study and encouragement, to the advancement of our knowledge of the freshwater fishes of interior North America.

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